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Non-destructive probing of magnetic excitations in an antiferromagnetic spin-1 Bose-Einstein condensate[1] XIAO CHAI, DI LAO, CHANDRA RAMAN, Georgia Institute of Technology — Spin-1 antiferromagnetic Bose-Einstein condensates (BECs) possess various magnetic excitations, e.g. magnetic solitons which we have recently studied [1]. Those magnetic excitations are uniquely characterized by the time evolution and spatial distribution of their magnetization and the domain walls in the nematicity. However in our previous work, probing of the magnetization evolution is limited by the destructive nature of Stern-Gerlach measurement. Stray magnetic field noise breaks the spin coherence and makes phase measurement, and therefore, characterization of the nematicity, unsuccessful. Here we investigate an experimental protocol to non-destructively obtain both magnetic and nematic information using repeated imaging via microwave excitation to the upper hyperfine level. By actively stabilizing the magnetic field, nematicity measurement is made possible with interferometry methods. Our protocol offers tools for characterizing magnetic excitations in spinor BECs, and eventually for understanding magnetic excitations generated in non-equilibrium processes. [1] Chai, Xiao, et al. "Magnetic solitons in a spin-1 Bose-Einstein condensate." arXiv preprint arXiv:1912.06672 (2019).

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